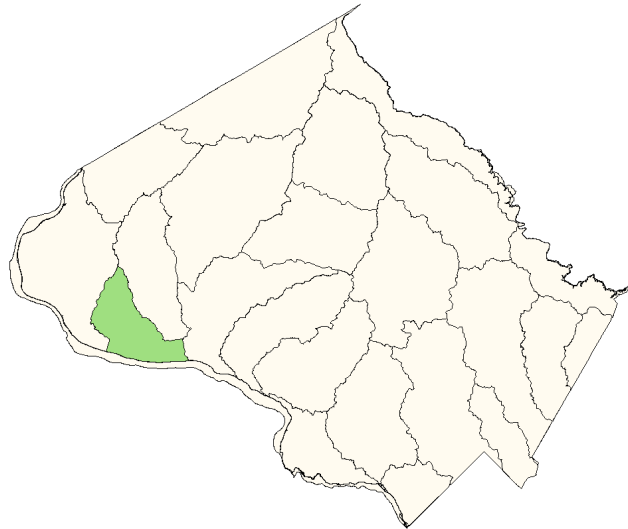# *Horsepen Branch*

Watershed Study

Montgomery County MD
Department of Environmental Protection
Watershed Management Division

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Executive Summary

      In the year 2000, Montgomery County Department of Environmental Protection monitored stream conditions at eight 75-meter stations within the Horsepen Branch Watershed. This watershed is located in western Montgomery County, MD (Figure 1). The parameters examined include: benthic macroinvertebrates, fish communities, water chemistry, and quantitative habitat. All parameters were scored and placed in one of four stream categories including *poor*, *fair*, *good*, and *excellent*. Overall, Horsepen Branch Watershed is in *fair* condition. Two of the eight stations have *good* habitat and are able to sustain *good* benthos (HBHB204, 217). Five stations (HBHB 117, 201, 209, 302, 304) showed an overall benthic condition of *fair* and *poor*. Examination of habitat parameters, especially embeddedness and sediment deposition, should be examined during the next scheduled Horsepen Branch Watershed monitoring. HBHB212 shows benthic impairment due to other than physical habitat and drainage area. The entire Horsepen branch was observed to have no flowing water in the channel during the summer and fall months. More investigation in better understanding the natural hydrological conditions of the watershed geography should be performed. Also over appropriation of groundwater and surface water by recreational and agricultural facilities should be examined.

I. Purpose of this Report

      The purpose of this report is to:

- Assess the existing stream conditions of Horsepen Branch,
- Identify stream reaches with impairment from other than habitat stressors,
- Identify stream reaches with unstable habitat features that, if left alone, could further degrade the biological community of the stream, provide recommendations for follow up actions concerning the identified areas of impaired stream reaches.

II. Introduction to the Watershed (excerpted from the Countywide Stream Protection Strategy)

      Horsepen Branch originates south of Poolesville near the intersection of Westerly Road and West Willard Road. Like Broad Run, Horsepen Branch is within the red Triassic sandstone geologic area rather unique to this part of the County. Predominantly, forests and croplands surround the Horsepen watershed (Figure 2). Horsepen Branch flows through the Poolesville Public Golf Course and onto the Izaak Walton League property where two tributaries join with the main stem. At River Road, the Horsepen Branch abruptly leaves the upland areas around Poolesville and enters the Potomac River floodplain. Above River Road, Horsepen Branch is a typical piedmont headwater stream with a series of pools and riffles along its length.

      Below River Road, Horsepen Branch loses its stream gradient as it enters the Potomac River floodplain in the McKee-Besher Wildlife Management Area. Many areas of the stream within the WMA have been impounded to provide different types of wetland habitat for many kinds of wildlife. These wetland areas have been designated as wetlands of state concern because of their botanical diversity and value to wildlife.

      The lower reaches are subject to Potomac River floodwaters that back water up the Horsepen Branch and cause bank erosion and sediment deposition into the stream. The temperature regime of the streams in the lower reaches of the Horsepen Branch may

also be affected by the Potomac River. Another possible cause, or contributing factor to conditions in the lower reaches are two large impoundments in the watershed.

In the spring of 2000 County biologists monitored sites within the Horsepen Watershed (Figure 1). These stations are located from Poolesville Golf Course south to the Potomac River. In the summer and fall, our monitoring crews noted there was no flowing water at any of the stations.   In the summer it was observed that there were only standing pools. In the fall months our crews went out to the closest station to the Potomac River to perform quantitative habitat analysis and noted that there was no water in the channel. Quantitative habitat analysis was only performed at that one station.
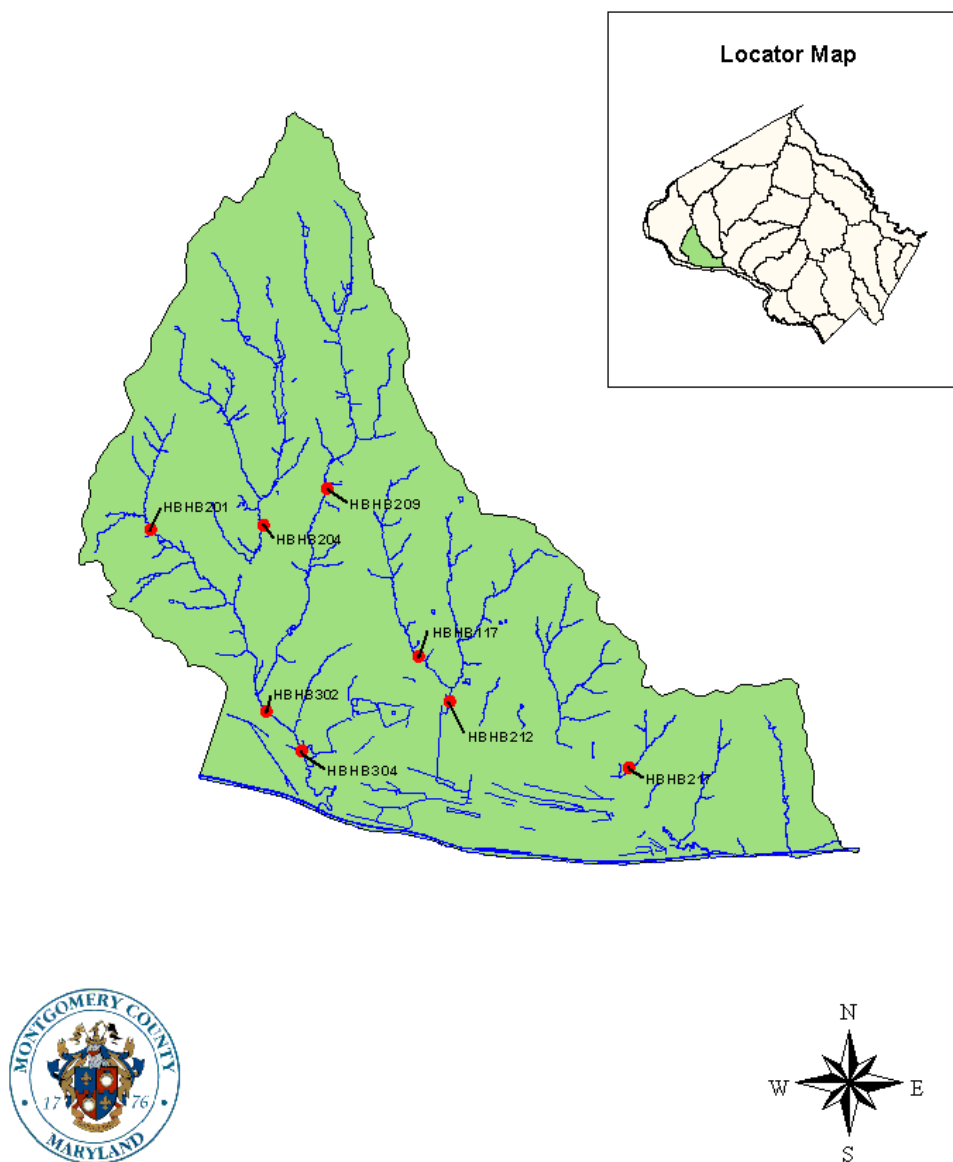
Figure 1. Monitoring Stations for 2000 Monitoring Season

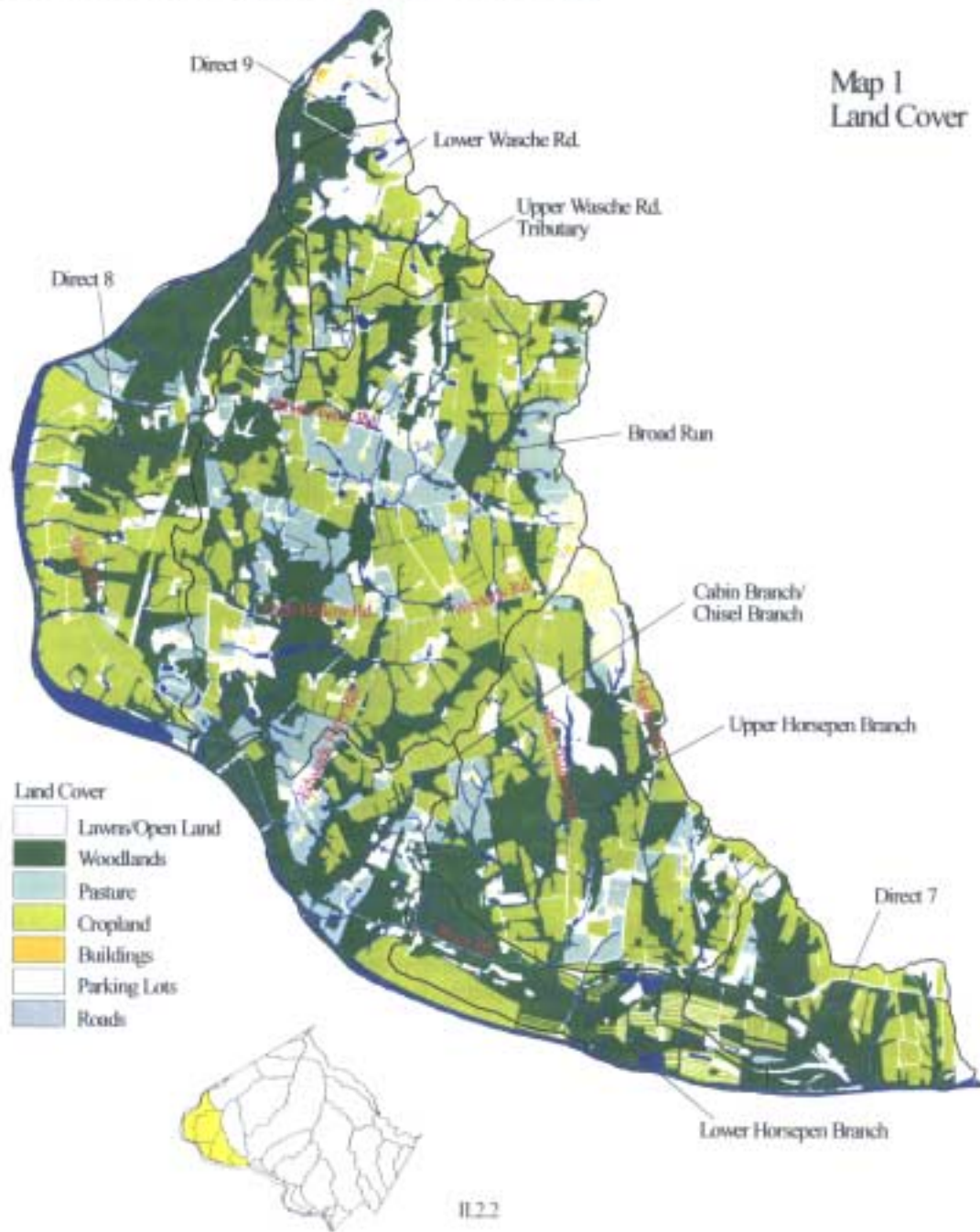# Broad Run, Horsepen Branch, Cabin Branch, Chisel Branch and Surrounding Potomac Drainage

Map 1
Land Cover

Direct 9

Lower Wasche Rd.

Upper Wasche Rd.
Tributary

Direct 8

Broad Run

Cabin Branch/
Chisel Branch

Upper Horsepen Branch

Land Cover
- Lawns/Open Land
- Woodlands
- Pasture
- Cropland
- Buildings
- Parking Lots
- Roads

Direct 7

Lower Horsepen Branch

IL2.2

Figure 2. Land Cover for Broad Run, Horsepen Branch, Cabin Branch, Chisel Branch and surrounding Potomac Drainages.

III. Methods

All fieldwork, data reduction, and data analysis follow the stream monitoring protocols described in Van Ness et al 1997. The overall stream condition was determined by assessing the cumulative impacts that occurred in the watershed as indicated by the use of an interim Index of Biological Integrity (IBI) for freshwater fish and benthic Macroinvertebrates The stream condition was made by examining the trends expressed by the two IBI's. This is not the same as averaging the two scores. Seasonal trends were examined and a yearly stream condition has been established for the subwatersheds.

Assuming that water quality is constant throughout the study area, the relationship between habitat quality and biological condition can be predictable, (Plafkin et al, 1989), and provide diagnostic information on stressors likely responsible for identified impairment to the existing stream area. Possible causes of impairment can be determined by examining the relationship between the IBI score/habitat score for each individual monitoring station (Figure 1). Percentage of the best attainable biological condition was calculated for each IBI score and compared against percentage of the best attainable instream physical habitat in order to assess relationships between habitat and biology and identify areas of stream impairment from other than physical stressors (Figure 3). The theoretical regression lines shown in Figure 1 describes the general relationship of biological condition to habitat quality in the absence of water quality effects. The highest possible IBI score for fish is 50 (100%), for benthic macroinvertebrates 40 (100%). Abiotic factors such as water temperature, water chemistry, and analysis of both qualitative and quantitative physical habitat attributes are also used to assess the types of stressors that may be affecting the system. Impaired sites are then targeted, and further investigations of the probable causes of impairment are scheduled.
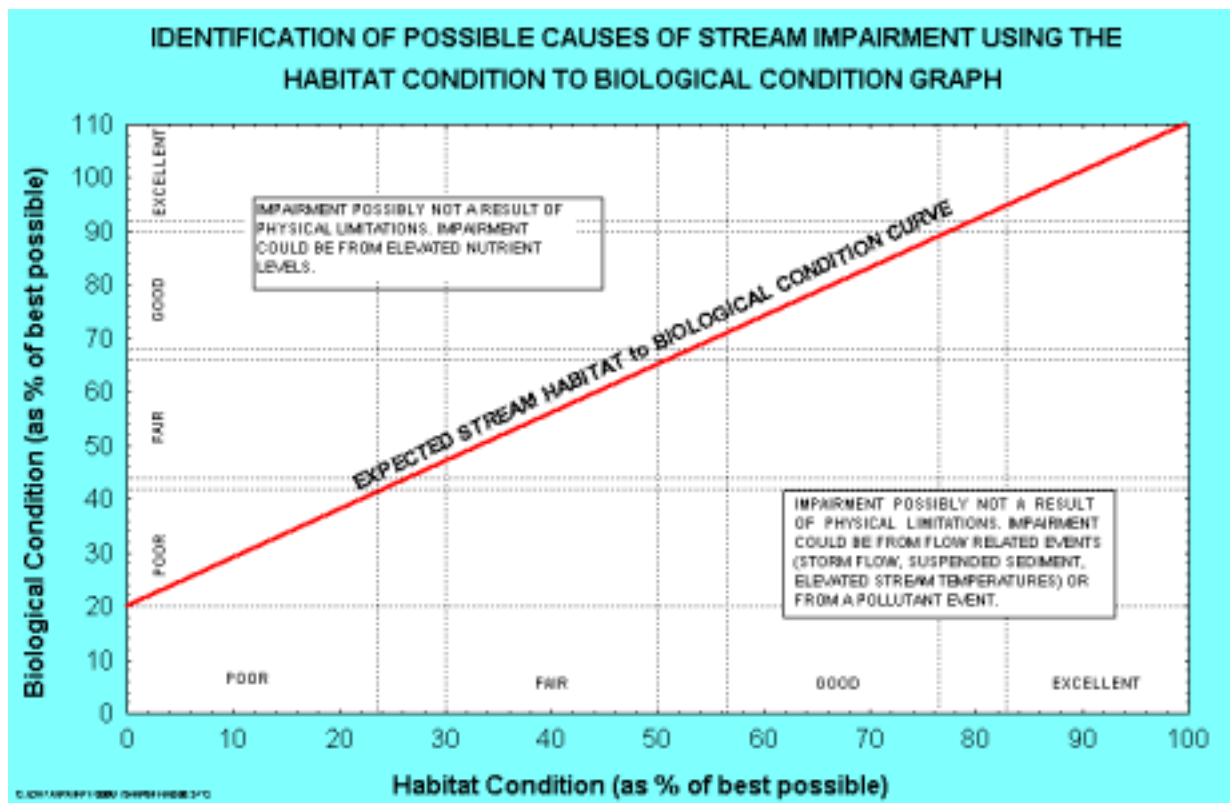

Figure 3. Conceptual Relationship between Habitat and Biological Condition

IV. Results

Stream Condition

Stream conditions for Horsepen Branch were evaluated by monitoring eight sites located from just west of the Poolesville Golf Course down to Maryland State Parkland west of Sycamore Landing Road. In six of the eight stations, the benthic communities scored the expected stream habitat to biological condition line (Figure 4).

1. Examination of IBI/Habitat Relationships

Data from eight monitoring stations were used in the assessment of the Horsepen Branch Watershed. Benthic macroinvertebrates were collected in March-April of 2000. Fish surveys would have been conducted during June-July of 2000; however, there was no flowing water in the channel for the surveys to be performed.

Benthic Macroinvertebrates

Two of the eight stations (HBHB201, 212) had a rating for habitat as *good*, but fell in the *poor* range for benthos (Figure 4). HBHB117 scored *fair* habitat and scored on the upper end of *poor* benthics. HBHB209 scored *good* in habitat and *fair* for benthos. Two stations (HBHB302, 304) both scored a *good* habitat, while also scoring a high *fair* benthic condition. The last two stations, HBHB204, 217, had a *good* rating for both benthos and habitat conditions.
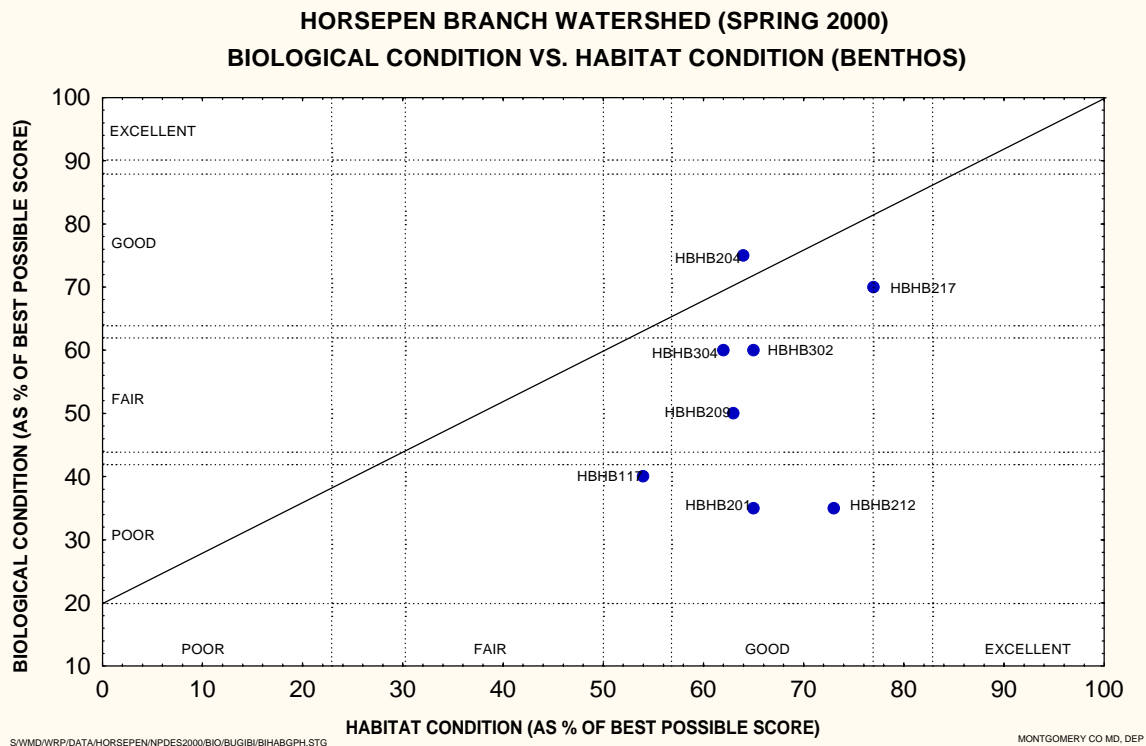

Figure 4. Biological Relationships vs. Habitat as a Percentage of the Best Obtainable Score in Horsepen Branch

Stations of Concern

Stations identified as areas of concern from the IBI/Habitat evaluation are listed in Table 1. These stations were identified because they plotted outside of the range of expected habitat/biology relationship for benthics. Stations HBHB 117, 201, 209, 212, 302, and 304 showed impairment in the benthic community due to physical habitat parameters (Table 1). Follow up monitoring will be performed during the next scheduled Horsepen Branch Watershed monitoring.

Table 1. Stations Considered Areas of Concern for Next Horsepen Branch Watershed Monitoring.

Monitoring Station	Location	Drainage Area (Acres)	Benthic IBI	Fish IBI	Recommended Action
HBHB117	River Road	171	Poor (16)	N/A	Revisit next scheduled monitoring
HBHB201	Isaac Walton League, Willard Road	375	Poor (14)	N/A	Revisit next scheduled monitoring
HBHB209	Poolesville Golf Course, Willard Road	1107	Fair (20)	N/A	Revisit next scheduled monitoring
HBHB212	Hunting Quarter Road	1083	Poor (14)	N/A	Recommend follow up in 2001
HBHB302	River Road	3787	Fair (24)	N/A	Revisit next scheduled monitoring
HBHB304	Sycamore Landing Road	3962	Fair (24)	N/A	Revisit next scheduled monitoring

One Station, HBHB 212, showed an impairment affecting the benthic community but did not show any physical habitat impairment (Table 2). It is recommended that a follow up field assessment be performed.

Table 2. Station Considered Area of Concern.

Monitoring Station	Location	Drainage Area (Acres)	Benthic IBI	Fish IBI	Recommended Action
HBHB212	Hunting Quarter Road	1083	Poor (14)	N/A	Recommend follow up in 2001

2. Rapid Habitat

Rapid habitat assessments conducted during the benthic monitoring scored an overall habitat condition as *good* for all station except HBHB117. In the fall, quantitative habitat assessment was performed for HBHB302, but due to no water in the channel, physical habitat was unable to be recorded.

Specific habitat parameters were examined to determine if individual parameters could explain some or all of the impairment observed in the benthic community. Out of our 10 habitat parameters, seven of these are good indicators of impairment from habitat

stressors.   The remaining three parameters were excluded for the following reasons. Channel alteration (channelization or dredging) is usually absent or minimal in County streams. The scores of bank vegetation protection usually follow those of bank stability (stable banks support a healthy vegetative cover). Finally, most riparian buffers in the County are 12 meters or greater. Scores for these three parameters are usually in the good to excellent range at all monitoring stations.

Table 3. Selected Habitat Parameters (Rapid Habitat Assessment) at Areas of Concern

Monitoring Stations		Fish Cover	Benthic Substrate	Embeddedness	Sediment Deposition	Bank Stability	Flow Status	Riffle Freq.
HBHB117	Spring 4/21	Fair	Fair	Poor	Poor	Fair	Good	Good
HBHB201	Spring 4/24	Good	Good	Fair	Good	Good	Good	Fair
HBHB209	Spring 4/28	Good	Good	Fair	Poor	Left- Good Right- Excellent	Fair	Excellent
HBHB212	Spring 3/29	Poor	Good	Good	Good	Good	Excellent	Excellent
HBHB302	Spring 3/30	Fair	Good	Fair	Fair	Good	Good	Good
	Fall 11/02	N/A	N/A	N/A	N/A	N/A	N/A	N/A
HBHB304	Spring 3/29	Good	Fair	Fair	Fair	Left- Excellent Right- Good	Excellent	Good

In the six stations of concern, no single habitat parameter is impairing all of the stations, however the majority of the stations are affected by high embeddedness and sediment deposition (Table 3). HBHB117 was observed to have good riffle frequency and flow status but all other parameters may need to be looked at for impairment. Fish cover, benthic substrate, and bank stability all were scored as fair. Sediment loading may be a problem since both embeddedness and sediment deposition scored were scored as being *poor*. This segment was noted for having heavy sediment deposits surrounding more than 75% of the stream bottom.

HBHB201 had five of the seven habitat parameters scoring *good*, while embeddedness and riffle frequency scored *fair*. County biologists noted that sediment deposits surrounded about 65% of the stream bottom.

The third station identified as an area of concern (HBHB209) had a flow status and embeddedness in *fair* condition and sediment deposition in *poor* condition. This meant that the large sediment loads within the stream affected the benthic community.

HBHB212 was not limited by any habitat parameter. Predominately, all parameters were in a *good* to *excellent* condition allowing for an overall *good* stream reach for habitat. However, the benthic community scored *poor*.

Benthic substrate, bank stability, flow status, and riffle frequency did not seem to impair HBHB302. Embeddedness and sediment deposition were limiting factors in the over physical habitat for HBHB302. These two parameters scored a *fair* condition.

Moderate depositions on new and old bars were observed while the streambed had 65% of fine sediments surrounding the 25% of mixed stable habitat.

At HBHB 304, sediment deposition seems to be affecting both the benthic substrate and embeddedness of the streambed. 75% of fine sediments surround the streambed and the epifaunal substrate is lacking for the benthos community. 45% of the new and old sand bars are also showing moderate deposition due to the sediment loads coming from upstream.

3. Water Quality

Physiochemical parameters measured during the monitoring year at these stations were examined for any indication of impairment from water quality stressors (Table 3). During the spring, dissolved oxygen and percent saturation all measured above the 5.10 mg/l and 55.7 % saturation criterion limit for State Water Use Class 1 Waters (COMAR 26.08.01-.04). State Water Use Class 1 Waters also describes normal pH values ranging between 6.5 and 8.5. Our stations in the summer were all within Maryland Department of the Environment's "normal" range. Lastly, the conductivity levels, in the four stations of concern, appear to be under normal natural levels. Overall, there are no water quality parameters that may affect the impairment of the stream.

Table 3. Physiochemical Parameters Measured During the Monitoring Year at Areas of Concern

Monitoring Stations		Time of Day	Water Temperature (°C)	Dissolved Oxygen (ppm)	Percent DO (%)	pH	Conductivity (µmhos)
HBHB117	Spring 4/21	10:36	12.4	9.86	116.0	6.73	116
HBHB201	Spring 4/24	N/A	N/A	N/A	N/A	N/A	N/A
HBHB209	Spring 4/28	13:56	11.6	11.54	106.0	7.72	217
HBHB212	Spring 3/29	14:30	17.0	10.32	98.6	6.65	181.3
HBHB302	Spring 3/30	10:35	9.43	10.71	93.0	7.00	138
	Fall 11/02	N/A	N/A	N/A	N/A	N/A	N/A
HBHB304	Spring 3/29	13:50	12.99	10.07	94.9	6.77	147.3

4. Quantitative Habitat

Quantitative habitat was surveyed during the fall/winter of 2000 for one of the Horsepen stations, HBHB201. Analysis of these measurements can provide further information to aid in deciding whether or not a habitat limitation, physical impairment, or water quality impairment is potentially influencing the fish and benthic macroinvertebrate communities. However, due to no water observed in the channel, quantitative habitat for flood prone width and width/depth ratio could not be calculated for this reach.

Riffle substrates were evaluated by conducting pebble counts where County biologists deemed a riffle was present in the spring sampling period at HBHB302.

Substrate analysis can determine whether or not particle size may be limiting benthic macroinvertebrate communities. The median (D^{50}) particle distribution was in the medium gravel range for HBHB302. Medium gravel is not ideal for benthic communities and this maybe a limiting factor in the overall benthic community. Also the D84 particle distribution was in the medium gravel class, which are about two particle size classes lower than the expected ratio. Overall, the sizes of the riffle particles seem to contribute to the slight impairment to the benthic community in HBHB302. The impairment is more of a natural impairment than a human one. The geographical region is located in the sandstone area, which are finer particle sizes.
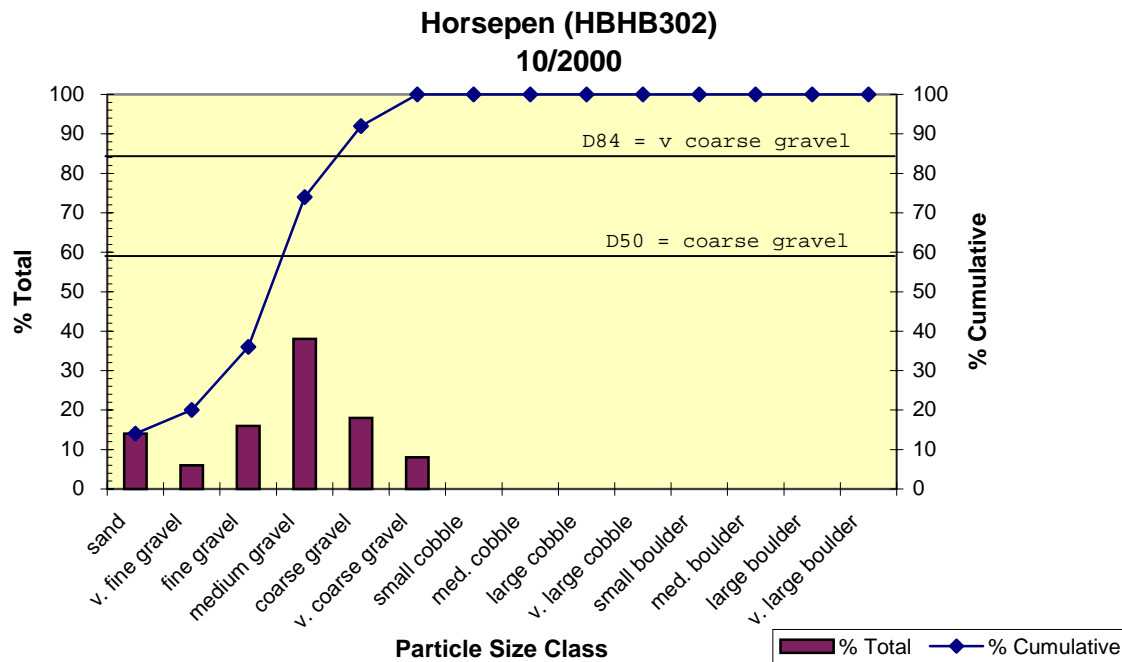

Figure 6. Analysis of Pebble Counts Taken in HBHB302's Riffle Habitat

5. Water Temperature Monitoring

Water temperature loggers were not deployed in Horsepen Branch, but grab samples were taken in the springtime. The grab sample temperatures showed no sign of impairing any of the organisms (Table 3).

6. Drainage Area

Drainage area is the cumulative amount of area that drains into each station of the watershed. Less than 300 acres is considered to be a small drainage area. In headwater streams, fish communities do not tend to be a reliable indicator of stream conditions. Benthic communities usually are more diverse in these areas. Drainage areas for the six stations of concern are listed in Table 1. HBHB 117 has a drainage area of 171 acres. Drainage area seems to have an impact on impairing the biological communities since its drainage area is less than 300 acres.

V. Discussion

Overall, two of the eight stations monitored in the Horsepen watershed during 2000 were in good health (HBHB204, 217). Five of the stations (HBHB117, 201, 209, 302, 304) were scored in *poor* to *fair* condition for benthos. Physical habitats for these five stations were scored as *good*; however, sediment deposition and embeddedness seem to be limiting factor and should be examined during the next scheduled monitoring of Horsepen Branch. The last of the eight stations, HBHB 212, shows no impairment to the benthic macroinvertebrate community by physical habitat. All physical chemistry data taken at each station in the spring were within the parameters detailed in the COMAR written by Maryland Department of the Environment.

It was noted that there was no flowing water in the channel during the summer and fall months, which greatly affects the biological community at all eight stations. Without constant water in the channel, the life cycle of many benthic organisms cannot be completed which ultimately reduces or eliminates the next generation of benthic macroinvertebrates in a stream. The natural droughty hydrology of the geography could affect the overall base flow in the stream. Also, any over appropriation of ground water or surface water by agriculture and recreation facilities should be investigated.

HBHB212 (off Hunting Quarter Road) has impairment affecting the benthic community from other than rapid habitat parameters since all scores were between *good* and *excellent*. The drainage area of this station is over 300 acres with *excellent* riffle frequency in this segment. Water chemistry, and other field assessments in 2001 should be examined to determine what is impairing this reach upstream.

VI. Literature Cited

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